CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: September 27, 2006

TO: St. Croix OHWM File

FROM: Pat Trochlell, Dan Houston, Dan Koich, Gary Lepak, Kristy Rogers

SUBJECT: Addendum to Lake St. Croix OHWM data

On May 26, 2004, the Natural Resource Board approved revisions to Wisconsin Administrative Code Ch. NR 118. At that hearing, members of the public asserted that the Ordinary High Water Mark (OHWM) last established by the Department for the Lower St. Croix River was inaccurate. The Department of Natural Resources then self petitioned for a declaratory ruling regarding the ordinary high water mark of the St Croix River, focusing on the area commonly known as Lake St Croix, with properties in question located along the Lower St. Croix River in St Croix and Pierce counties, Wisconsin. In August 2004, the Department began the declaratory ruling process and after due notice held a hearing pursuant to s. 227.41, Stats., on August 31, 2005, in Hudson, WI to afford full opportunity for input from interested parties. After the hearing and upon request of the hearing officer, additional Department Staff were commissioned to conduct additional field work regarding the OHWM. This report summarizes that fieldwork and data and recommends an OHWM based upon the additional data gathered.

A team (Team) comprising of experienced Water Management Staff from around the State was formed to gather and analyze additional data for the establishment of an ordinary high water mark (OHWM) on Lake St. Croix, St. Croix County, Wisconsin. The team consisted of Pat Trochlell, Wetland Ecologist – Madison; Dan Houston, Aquatic Habitat Coordinator – Park Falls; Dan Koich, Water Management Specialist – Eau Claire; Gary Lepak, Water Management Engineer – Eau Claire; and Kristy Rogers, Aquatic Habitat Coordinator – Green Bay. The team's goal was to investigate additional selected sites, review the existing data collected by the Department, and form a recommendation for the OHWM of Lake St. Croix. The information in this report is intended to supplement and not duplicate information in existing reports. Supporting maps, photos and charts are set forth in the attachment.

METHODOLOGY

A list and map of the chosen sites were provided to the Team. The list was created by Mr. Robert Rolle and included sites throughout Lake St. Croix. Mr. Rolle is a riparian owner on Lake St. Croix and a member of the Town of Troy Planning and Zoning Committee. Mr. Rolle placed lathe painted with fluorescent orange paint on the shoreline to identify the sites from the water. Additional information was also collected at sites selected by the Team.

Field work was conducted via boat on Wednesday August 2 and Thursday August 3, 2006. Additional elevation data was obtained on September 25, 2006. The Team visited each site and completed a comprehensive investigation of the biological and physical OHWM indicators throughout the site. Elevations were taken at the OHWM indicators at each site. The Team met after the field investigations to finalize the data and conclusions.

The OHWM was defined by the Court in Diana Shooting Club v. Husting as the "point on the bank or shore up to which the presence and action of surface water is so continuous as to leave a distinct mark either by erosion, destruction of terrestrial vegetation, or other easily recognized characteristic." During

the field investigation, the Team used this formal definition, the Department OHWM guidance (Chapter 40), and their previous training and experience in making OHWM determinations to identify the OHWM indicators on Lake St. Croix.

All elevations are in the US Army Corps of Engineers (COE) 1912 Datum unless otherwise noted. This is consistent with the datum used by the COE for water level measurements at Prescott and Stillwater. Conversion to 1929 datum or 1988 NGVD can be supplied if needed.

The technique "water level transfer" was used to obtain the elevations of the OHWM indicators. Hourly water level data from Prescott and Stillwater was used.

Current and past water levels were obtained off the COE water level internet site. To correlate the water levels with the various sites, date and times were recorded so the appropriate water levels of the gages could be obtained.

When on site, four methods were used to calculate the elevations of the indicators with the corresponding water levels. Site conditions and location of the indicators determined which method was used.

1. Auto level with a stadia survey rod
2. Hand level with a stadia survey rod
3. String level with a stadia survey rod
4. Direct measurement from the water surface to the indicator of interest (This method was used at Site 6).

With these methods, it is the Department's opinion that the elevations are within +/- 0.01-0.02 feet. This is why the data is given to the nearest tenth of a foot.

DATA

The data below is summarized by describing the dominant OHWM indicator/indicators first. This is followed by a description of what was found above and below these dominant indicators. All elevations are referenced to 1912 US Army Corps of Engineers Datum.

The following data was gathered on Wednesday, August 2, 2006. The weather was sunny and the temperature was between 75 and 80 degrees. Rain had fallen the previous night and ended at approximately 9 a.m. Winds were light. The field work was conducted between 10 a.m. and 6 p.m.

Site 1 - Kinnickinnic State Park – "South Bay" (Site selected by Team)

This site is a rocky sloped shoreline on the east side of the Lake. Staff investigated indicators from the sandy shallow delta area (the outlet of the Kinnickinnic River) south (downstream) several hundred feet. This portion of the shoreline is protected from ice and waves. The site was difficult due to the variability in the size of the rocks on the bank. The rock variability impacted the growth of vegetation. The dominant OHWM indicator at this site is the destruction of terrestrial vegetation. The elevation of this indicator was taken at a more open location along the shoreline. This section of the shoreline had a more uniform rock size and bank slope along with a more open vegetation canopy.

At the elevation of the dominant OHWM indicators, there is a change from a washed rock/gravel substrate (below) to rock/gravel with leaf litter and accumulated organic material (above). There is a debris/drift line. There is a change in density and type of vegetation.

Above the dominant OHWM indicators, the herbaceous layer becomes much denser and is dominated by Common Buckthorn (Rhamnus cathartica), Indian Hemp/Dogbane (Apocynum cannabinum), Poison Ivy (Toxicodendron radicans) and Virginia Creeper (Vitaceae parthenocissus). The tree layer is dominated by Red Oak (Quercus rubra), White Pine (Pinus stobus), Common Buckthorn, American Elm (Ulnus Americana), and Dogwood (Cornus) species.

Below the dominant OHWM indicators, vegetation was sparse. The dominant tree species are Silver Maple (Acer saccharinum), Green Ash (Fraxinus pennsylvanica), and Cottonwood (Populus deltoides). Trees have damaged bark. There are sparse small plants of Common Buckthorn – likely one year or less in age. The herbaceous layer is dominated by Hummock sedge (Carex stricta), other sedge species, Silver Maple seedlings, Beggar-Tick (Bidens) species, Dogbane, Spikerush (Eleocharis) species, Rice Cutgrass (Leersia oryzoides), Blue Scullcap (Scutellaria lateriflora), Canada Anemone (Anemone Canadensis), Dandelion (Taraxacum officinale) seedlings, Green Ash seedlings, and False Dragonhead (Physostegia virginiana).

Moss is not a good indicator at this site. Moss was found both upslope and downslope of the dominant OHWM indicator. There appeared to be a change in species of the moss at the dominant OHWM indicator. Samples were taken of both to be identified by an expert in mosses.

The elevation was taken using a hand level and is 681.9. All of the elevation data is summarized in the attachment.

Site 2 - Kinnickinnic State Park

This site is several hundred yards downstream of Site 1 in the vicinity of the Rolle lathe marker and on the east side of the lake. This site is also a rocky sloped shoreline. However the rocks are more uniform in size. The upstream portion of the site has a delta with sand and a gentle slope. The delta is below a ravine/drainage way. The site is exposed to wind, wave and ice forces.

The elevation of the dominant OHWM indicators were taken downstream and away from the effect of the drainage and delta areas.

At the elevation of the dominant OHWM indicators at the measurement site (See Attachment Site 2 Location A), are horizontal pipe roots on a Red Mulberry (Morus rubra) tree. The horizontal roots are immediately above the selected elevation. There is a corresponding deformed growth (bulbous formation) and similar horizontal roots on an adjacent Green Ash tree (the Ash tree appears to have slumped slightly). A change from a washed rock/gravel substrate (below) to rock/gravel with leaf litter and accumulated organic material (above) was found at a corresponding elevation upstream of the selected measurement site (See Attachment Site 2, Location B). There is also a debris/drift line and more obvious change in density and type of vegetation at this location.

Above the dominant OHWM indicators, there is a water stain on the Mulberry. There is limited vegetation for two to three feet because of the rock and steep slope at Location A. There is a more dramatic change in vegetation at Location B. The dominant vegetation includes American Elm, Honey Suckle (Lonicera) species, and Virginia Creeper.

Below the dominant OHWM indicators, vegetation is dominated by Indian Hemp, Green Ash, Silver Maple seedlings, Sandbar Willow (Salix exigua), and False Indigo-bush (Amorpha fruticosa). There are a few grape plants within the sandbar willow. The sandbar willow appears to be sheltering these plants. There are multiple, less dominant, debris/wash lines.

The elevation of the dominant OHWM indicators is 681.2.

Site 3 - Carpenter Nature Center

This Site has the most dominant and consistent OHWM indicators of all of the sites reviewed by this Team. This site is located downstream and southwest of Site 2 and on the west shore. The linear rock shoreline described here as Location 1 (See Attachment Site 3, Location 1) along with the sand dominated floodplain area described here as Location 2 (See Attachment Site 3, Location 2) were investigated. Location 1 is approximately 200 feet downstream of the existing pier and is subject to ice, wind and boat wakes. Location 2 is upstream of the pier and is a protected floodplain forest area. The interior is protected from ice and strong waves from the north. The soil is sand.

Location 1 - As viewed from the boat, there are obvious physical indicators of water stain and destruction of vegetation along the rock lined shore. At the elevation of the dominant OHWM indicators, there is a change from a washed rock substrate (below) to rock with organic material and leaf litter (above). Vegetation becomes common at this elevation and is dominated by Green Ash and False Indigo-bush. There are lateral roots and deformed (bulbous) growth on Green Ash trees immediately above the OHWM. The False Indigo-bush grows out of the bank and turns up. The color of the rock changes from light to dark abruptly at this location. There is also a corresponding stain on the trees. (See Attachment Site 3, Location 1)

Above the dominant OHWM indicators, the vegetation becomes denser and consists of Green Ash, American elm, and Eastern Red Cedar (Juniperus virginiana). There is rock with organic material and leaf litter, the rock is darker in color, and the vegetation density increases. The roots, rocks, and soil are distinctly darker in color.

Below the dominant OHWM indicators, the rock is “washed” clean of soil, the vegetation is very sparse with a few plants of Sandbar Willow and False Indigo-bush. The tree roots are damaged and distinctly lighter in color.

The elevation of the dominant OHWM indicators is 681.6.

Location 2 – A distinct stain on the trees is a strong physical indicator of the OHWM in this sand floodplain forest area (See Attachment Site 3, Location 2). The area is dominated by Silver Maple, Cottonwood and Black Willow (Salix nigra). Cottonwood and Box–elder (Acer negundo) are more dominate in higher elevations within the forested area. There are several young Green Ash trees at lower elevations but very few mature Green Ash trees.

Above the dominant OHWM indicator (distinct stain on the trees), the color of the bark of the trees is darker.

Below the dominant OHWM indicator, the trees show damage and are redder in color. The dominant species are Silver Maple, Black Willow, Cottonwood, Sedge species, Calico Aster (Aster lateriflorus), Green Ash seedlings (which are damaged, stressed and young) and Cardinal Flower (Lobelia cardinalis).

The elevation of the dominant OHWM indicators is 681.7.

Site 4 – Halvorsen

This site is located on the east shore of Lake St. Croix north (upstream) of Kinnickinnic State Park. The site is a rock shoreline exposed to wind, wave and ice action. The Team looked for indicators approximately 100 feet north of the pier. The pier area was heavily disturbed by manmade shoreline manipulations. This site had few and indistinct OHWM indicators.

The OHWM indicators at this site are a stain on a large rock and trunk damage on a Green Ash tree. There is also a change in density and type of vegetation.

Above the elevation of the OHWM indicators, vegetation becomes denser and is dominated by Rose, Ninebark (Physocarpus opulifolius), Burr Oak (Quercus macrocarpa), E. Red Cedar, Red-osier Dogwood (Cornus stolonifera), Common Buckthorn, Green Ash, and False Indigo-bush.

Below the elevation of the OHWM indicators, vegetation is sparse and is dominated by Willows and Sedges.

The elevation of the dominant OHWM indicators is 681.4.

Site 5 – Goose/Hidden Lake

This site is located off of the Lake on an impoundment separated by a berm from the Lake. The bank along the Lake is rocky sand and contains Sandbar Willow, Button Bush (Cephalanthus occidentalis) and Clammy Weed (Polanisia dodecandra). The Team investigated the area along the east side of the impoundment. There was an ATV trail/road along the bank. It is unknown how this road has impacted the OHWM indicators in this area. This area is not subject to the same wind/wave/water elevation impacts because it is not on the Lake. For the above reasons, no OHWM indicators were identified at this site.

The following data was gathered on Thursday, August 3, 2006. The weather was sunny and the temperature was between 80 and 85 degrees. Winds were light. The field work was conducted between 9 a.m. and 7:30 p.m. Additional photos were taken at the previous day's sites prior to investigating the new sites.

Site 6 – Vertical Rock Shoreline at Kinnickinnic State Park (Site selected by Team)

Photographs and an elevation were taken at the distinct stain on the vertical rock bank north of the pier at the State Park. This site is downstream from Halvorsen . The site is exposed to wind, wave, and ice energy. This stain is one of the most dominant OHWM indicators on the system. This indicator stands the test of time.

The elevation of the dominant OHWM indicator is 681.6.

***As you travel upstream between Sites 6 and 7, the shoreline changes from a steeply sloped rock and/or vertical solid rock shorelines to more gentle sloped sandy shorelines.*

Site 7 – Soil Bench (Site selected by Team)

This site is located approximately 1000 feet south of the Marzoff property on the east side of the Lake. The site was viewed from the water as the property owner is unknown. There is a distinct eroded organic (dark in color) soil bench above the sand beach area. Destruction of vegetation is very distinct. There is dense vegetation above the soil bank with little to no vegetation below it. This site is different from many of the sites in this section of the Lake/River because it is not impacted by the deposition of sand during flood events.

The elevation where the dark organic soil bench meets the washed beach sand is 681.8-681.9. This elevation was taken using a hand level from a boat. Because of this, the elevation is not as accurate as the sites that were done on the land.

Site 8 – Tilton Property

This site is located on the east side of the Lake. The Team looked at the area south of the pier and the manmade shoreline manipulations. The site is sandy/gravel with larger rocks at or near the water level on the day of observation. There is a gradual slope. There is a long sand dune ridge that runs parallel to shore. This sand dune ridge appears to have been recently deposited during a high water event. Moss is not a reliable OHWM indicator at this site because there is no distinct change in the presence/absence of moss on the higher or lower areas of the site. Moss is present on rocks that are currently in the water, rocks that are located further upland, and on rocks that are above the current waterline but clearly on riverbed. A sample of the moss was collected. Determining prominent and persistent OHWM indicators at this site is more difficult due to the sand and the unknown age of the sand depositions (there was a flood in 2001). There are multiple washed rock/debris lines as you move up the bank. This site is exposed to wind, wave, and ice energy with a considerable fetch length from the northwest. Mr. Tilton had the elevation 681.5 marked by lathe on the property. Vegetation at the site did not provide distinct indicators of the OHWM. Several vegetative species were found below the OHWM that were not found in other areas of the Lake. These species however had buttressed roots and multiple trunks, growth forms that indicate the presence of water, and appeared from their size to be younger in age. The smaller size could also be contributed to slow growth likely due to unfavorable growth conditions.

The dominant OHWM indicators at this site were an eroded soil bench along with an exposed root mass. The elevation was taken immediately below the root mass. If you follow the elevation of the root mass downstream, a corresponding change and destruction of terrestrial vegetation is visible at that elevation along the property.

Above the dominant OHWM indicators, there is a weak debris/wash line and scattered smaller rocks. The rocks are not in a wash zone pattern like found below this elevation. There is a large rock with a prominent stain. (This rock was not a strong OHWM indicator because the source of the stain was unknown. The stain may have been a water stain or a stain caused from the surrounding soil.) Burr Oak and Grapevine become the more dominant vegetation.

Below the dominant OHWM indicators, there are multiple washed rock lines. There is a stain on an old building foundation. Vegetation is sparse. Vegetation consists of Green Ash with multiple trunks, American Elm, Cottonwood, Indian Hemp, Cottonwood seedlings, Moonseed (Menispermum canadense), Lady's Thumb (Polygonum persicaria), Switchgrass (Panicum virgatum), Silver Maple, Swamp White Oak (Quercus bicolor), Horsetail (Equisetum) species, False Indigo-bush, young Grapevine plants (located higher on the beach), and Sandbar Willow.

The elevation of the dominant OHWM indicators at this site (eroded soil bench and root mass) is 681.7 Additional elevations were also taken. The elevation of the debris line is 683.2. The elevation of the stain on the rock is 682.5. The elevation of the stain on the old building foundation is 681.4.

Site 9 – Railroad Swing Bridge

This site is located on the upstream side of the swing bridge on the west side of the Lake. Several hundred feet of shoreline were investigated. There is a transition from a gradual sloped sand shoreline to a steep rock bank. As you move upstream, the toe of the railroad track slope gets closer to the water. The railroad track slope is protected with rock. This shoreline is impacted by wind, wave and ice energy with a considerable fetch from the northeast. This is another difficult site because of the gradually sloping sand shoreline and physical OHWM indicators that do not correlate to each other.

The exposed horizontal roots of older trees along with the prominent stain on a large rock are the most dominant indicators of the OHWM at this site.

Above the elevation of the dominant OHWM indicators, are stains on trees, a distinct debris line, damaged tree bark and a distinct change in vegetation. The change in density and type of vegetation is located at approximately (within 0.1 feet) the same elevation as the debris line and tree bark damage. These indicators were not considered the dominant indicators at this site. The damage on the tree bark appeared to have been from debris and or ice damage. This type of damage is normally located above the OHWM. The debris line reflects recent water level changes and does not stand the test of time. Vegetation above the dominant OWHM indicators is dominated by Grape Vine, Poison Ivy, Green Ash, Common Buckthorn, Canada Anemone, Calico Aster, Muskingum Sedge (Carex muskingumensis), and White Snakeroot (Ageratina altissima).

Below the dominant OHWM indicators are trees with expansive washed out root systems, a debris line consisting of woody debris and very few to no herbaceous or non-woody vegetation. There is also a more defined bank and undercut root masses. Vegetation is dominated by Cottonwood, Box-elder, Green Ash, and Clammy Weed.

The elevation of the dominant OHWM indicators (stain on rock and horizontal roots) is 681.9. The elevation of the debris line is 683.2. The elevation of the tree bark scar is 683.15. The elevation of the base of the defined bank and the bottom of the undercut root mass is 681.6.

Site 10 – Green Property

This is a long sandy property on the east side of the Lake upstream of the railroad swing bridge. As you travel south (downstream) on the property, the edge of the bluff gets closer to the water. This is a sandy site with gradual slopes. The site is exposed to wind, wave, and ice damage. OHWM indicators were documented along the southern portion of the property.

At the elevation of the dominant OHWM indicators, there is a change in vegetation, a debris line containing woody debris and rocks, an erosion line on the soil bank, and horizontal pipe roots of cedar trees.

Above dominant OHWM indicators, vegetation becomes more established. E. Red Cedars are common along the OHWM and above. The lower cedars have multiple trunks and exposed roots. Vegetation consists of False Indigo-bush, Red Oak, Whorled Milkweed (Polygala verticillata), White Snakeroot, Common Buckthorn, Grape Vine and Smooth Brome (Bromus inermis).

Below the dominant OHWM indicators, vegetation consists of Green Ash, Black Willow, False Indigo-bush, American Elm, Silver Maple, Sandbar Willow, Cottonwood seedlings, Beggar-Ticks, Red-Root Amaranth (Amaranthus retroflexus), Lady's Thumb, and Sedges. There is a debris line with smaller woody debris and a fairly clean washed sand substrate. There is a more dominant line of trees with non woody vegetation growing immediately downslope.

The elevation of the dominant OHWM indicator is 683.2. The elevation of the stain on the Cottonwood tree is 682.3.

Site 11 – Richards Property

This is a sandy shoreline that changes to cobble with a gradual slope to the bluff. The site is on the east side of the Lake. The bluff has slumped making it difficult to assess the reliability of the OHWM indicators. There is a long northwest fetch. There are seeps discharging groundwater along the beach. Similar to the Green property, there is a distinct line of vegetation down slope from the base of the bluff. Elevations were taken however the OHWM indicators found are not reliable.

An elevation was taken at the base of the bluff. This elevation is 682.3. At this elevation, there is a debris line consisting of woody debris and an erosion line. There is also cobble sized rock (2-8 inches in diameter). This is the largest sized rock on a gradual sloping shoreline of all the sites. Upslope of the bluff has Red Oak, Basswood (Tilia Americana), E. Red Cedar, Quaking Aspen (Populus tremuloides), Black Raspberry (Rubus occidentalis), Groundnut (Apios Americana), Grape, Hog Peanut (Amphicarpaea bracteata), and Canada Anemone.

An elevation was taken at the vegetation line. This elevation is 679.2. The vegetation line is dominated by Sandbar Willow and Silver Maple. Between this line of vegetation and the base of the bluff is an area with very sparse vegetation and cobble (2-4 inches in diameter). It is roughly 18 feet between the base of the bluff and this line of vegetation. Other vegetation in this area includes Green Ash, Red-Root Amaranth, Silver Maple seedlings, Spirodea, Polyghiza, Cottonwood seedlings, Rumex sp., Polyginum persicaria, Eleocharis acicularis, Prostrate equisetum, Polyginum sp., and Eleocharis sp.

There were water stains and erosion 10 feet above the bluff – bank intercept. This likely was caused by the 2001 flood.

DISCUSSION

Setting the OHWM for Lake St. Croix is a difficult task due to the size of the waterway, flow and water level fluctuations, lake (wind wave action) and river (linear flow and flooding) forces, and differences in shoreline orientation, bank slope and bank composition. It is apparent from the indicators observed that this waterbody experiences sustained periods of high water during the spring and large storm events. There are also normal water level fluctuations of ten feet each year. In flooding years, the fluctuation can be as great as fifteen feet. The OHWM indicators varied in type and elevation throughout the Lake. The recommended OHWMs are based upon two things. One, they are based upon the more permanent and distinct indicators of an OHWM, including erosion, changes/destruction of terrestrial vegetation, and stains on trees, structures, and rocks on the bank or shore. Secondly, they are based upon the existence of consistent OHWM indicators at one site. (Some sites had OHWM indicators at varying elevations while some had consistent OHWM indicators at or near one elevation.) Stains on permanent structures located within the Lake (not on the bank) were not determined to be the best indicators. These stains can be a guide however they are not an indicator on the bank or shore as required by the Supreme Court definition (see definition below). Stains on permanent man-made structures along the bank were not by themselves

considered the best indicators. They often reflect static water levels and do not exhibit evidence of the "action" of water.

The vegetative indicators of the OHWM were easy to identify at some of the sites while more difficult at others. In the locations containing rock shorelines, the destruction of terrestrial vegetation was very obvious and was exhibited by a drastic change in density. At the sandy sites however there was a more gradual transition of vegetation changes. The Team used the change in density of the vegetation along with the specific species, age, and health of the plants to determine the dominant OHWM indicators for each site. Green Ash tress were consistently found along and above the dominant OHWM indicators. Green Ash trees that were found below the dominant OHWM indicators were small and had growth forms (buttressed roots and multiple trunks) adaptive to prolonged higher water levels. Silver Maple and Cottonwood were commonly found below the dominant OHWM indicators and rarely found above it. Poison Ivy was commonly found above the dominant OHWM but not below it. Cedars were also a dominant indicator of the OHWM. Cedars were not found below the elevation of the dominant OHWM indicators.

The Team used the data collected previously as a guide. The previous data was collected by identifying OHWM indicators along a transect that ran perpendicular to the shoreline. The most dominant OHWM indicators were not determined for each individual site, nor was an assessment of the surrounding area made. Because of this methodology, the Team was unable to determine the strength and consistency of those indicators. This statement should not be used to discount the data; it simply reflects the limitations the Team experienced when using the data.

The railroad causeway upstream of Hudson appears to have an impact on the OHWM based upon the OHWM information gathered and water elevation data taken at Stillwater and Prescott. Because of this impact, two OHWM elevations are recommended – one upstream of the railroad causeway and one downstream.

The recommended OHWM upstream of the railroad causeway is 681.9. This elevation was chosen based upon the most distinct OHWM indicators, which were found at Site 9. The exposed horizontal roots along with a prominent stain on a large rock are the most dominant indicators of the sites north of the railroad bridge. These physical and vegetative indicators exhibit the action and presence of water over long periods of time.

The recommended OHWM downstream of the railroad causeway is 681.6. The most distinct indicators in this area were water stains on the bluff at Site 6; and destruction of terrestrial vegetation and rock and vegetation stains at Site 3. These physical and vegetative indicators show the action and presence of water over long periods of time.

CONCLUSIONS

1. The railroad causeway north of Hudson is a man-made constriction and has an impact on the flow of water through the Lake.
2. The recommended OHWM north (upstream) of the railroad causeway is 681.9.
3. The recommended OHWM south (downstream) of the railroad causeway is 681.6